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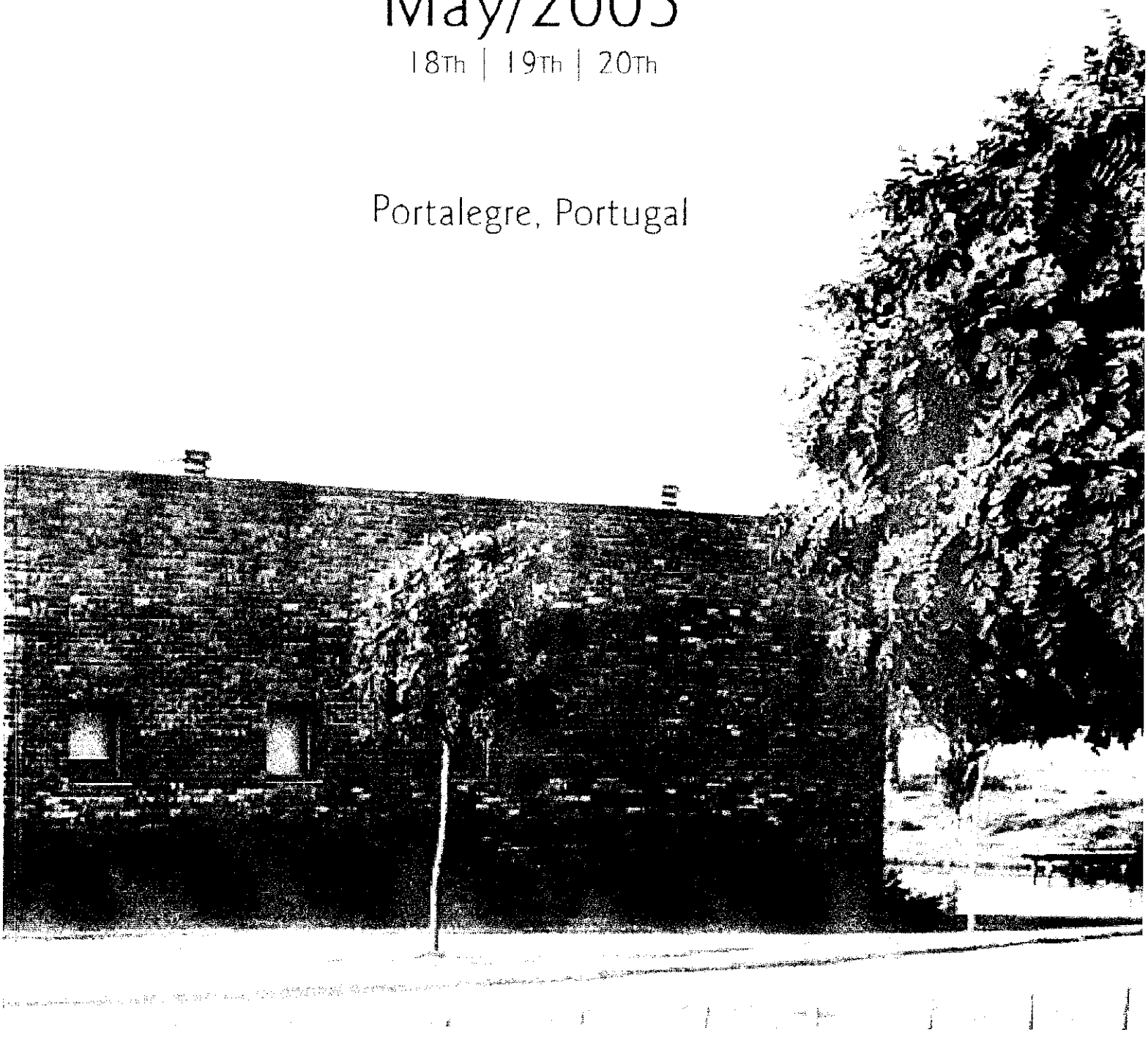

In search of environmental friendly structures: A Comparative environmental evaluation of steel structures and reinforced concrete structures

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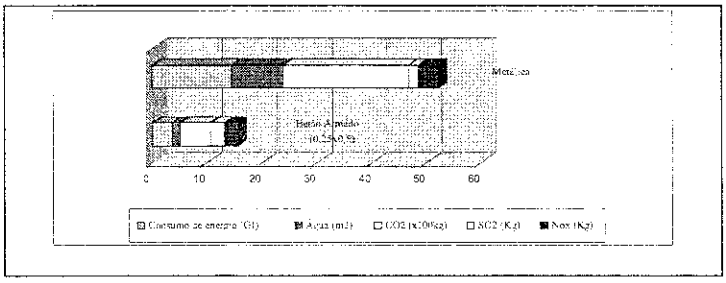
1. Introduction - This research project deals comparative evaluation of steel and reinforced concrete structures using a simplified Life Cycle Assessment of a given structure. The methodology consisted in quantification of the materials needed for the structure using reinforced concrete and an equivalent steel structure. The environmental and economic costs of the materials used are then quantified along a number of parameters. The evaluation consisted in comparing the environmental impacts caused by the manufacturing of the materials in question and their transportation to the site. The effects of works done at the site such as production of concrete and its compaction or placement of steel structure were not considered.

Furthermore, the research work studied different concrete and reinforcement sections in order to establish the most favourable reinforced concrete structure in environmental terms. It was observed that the recommended economical sections do not coincide with the recommended environmental ones. The economic evaluations of the structures as well as the environmental impacts were performed using software developed in this research project and the data were collected directly from the manufactures.

2. Methodology of the Research Work – The methodology applied in this research work was to use the Life Cycle Analysis. The following steps were taken: Selection of the structure; Designing of the Steel and Concrete Reinforced Structure for performing the functions defined; Quantification of the building materials needed for the structure; Collection and analysis of the needed data; Selection of the environmental parameters to be used; Quantification of the environmental parameters for steel and reinforced concrete structures; Analysis of the representative comparative graphs; Determination of the most environmentally favourable steel percentage in concrete structure; Conclusions.



3. Results and Conclusions: The analysis of the results obtained, such as that presented in the above figure, it may be concluded that for the case studied, the environmental impacts caused by the steel structure are largely superior to those caused by the reinforced concrete structure. Consequently, for cases such as that considered in the research work, which has common application in construction industry, reinforced concrete material is more environmental friendly than steel structures. However, it is noted that the work at site is not considered in this research work and may affect the final results to some extent, although it is not foreseen to be a significant degree.

4. References

[1] - CIMPOR – Relatório de Sustentabilidade: Actividade económica, ambiental e social. Multitema, 2003.